

Seismic sight

Standard 3200-0201 Construct and defend a model of Earth's crust and interior.

- Examine, through experimentation, the properties of materials making up Earth's crust (e.g., rocks and minerals).
- Experiment with materials of different densities.

Standard 3200-0202 Analyze current and past ideas about the structure of Earth.

- Research and report methods geologists use to investigate Earth's structure.

Intended learning outcomes:

1. d. Make estimations and predications based on observations and current knowledge.
2. Use Integrated Science Process Skills
 - a. Identify variables and describe relationships between them.
 - b. Formulate research questions and hypotheses.
3. Manifest Scientific Attitudes and Interests
 - a. Maintain a sense of curiosity about natural phenomena.
5. d. Understand natural and human-produced systems in science (appropriate to grade level):
 2. Predict how changes in one part of a system will likely affect the rest of the system.
7. Understand the Nature of Science
 - a. Understand that the goal of science is to produce a systematized body of knowledge consisting of concepts, theories, and generalizations that have explanatory and predictive power.



Background:

There are two classes of seismic waves: body waves, which travel at high speed through the deeper, denser rock within the body of the Earth, and surface waves, which travel at a slower speed through rock near the Earth's surface. The body waves precede the surface waves. There are two types of body waves: P-waves, which are similar to sound waves, and the slower but more damaging S-waves. P-waves travel about 4.8 to 8.0 km (3 to 5 miles) in one second, while S-waves travel about 3.2 to 4.8 km (2 to 3 miles) in one second. Surface waves are slower still and can cause even more damage due to their greater duration.

After the occurrence of an earthquake scientists observed that seismographs on the opposite side of the earth recorded P waves but did not record S waves. This lead them to try to discover what was inside the earth to cause this to happen.

Use the following simulation to try to discover the internal structure of the three spheres.

Time Required:

45 minutes

Summary:

Students will observe both the slow and rapid growth of iodine crystals. They will then compare their observations to the process of lava/magma cooling at different rates.

Materials:

- Paper
- Pen or pencil
- The image links below

PROCEDURE

Step 1. Below you will find three spheres. Each of them has a different hidden internal structure.

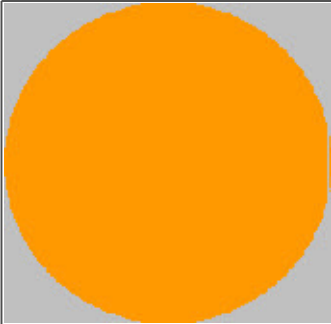
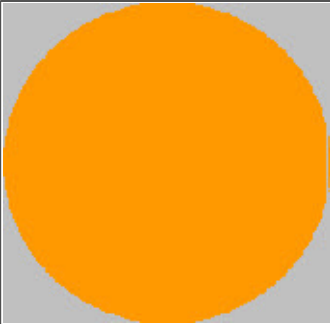
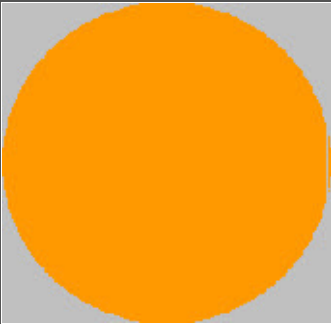
Step 2. Below each sphere you are given the choices of sending different types of seismic waves through each sphere. **View each simulation by dragging your mouse over the choice. Do NOT drag over the "Check your hypothesis" link until Step #4.** Watch each simulation and form a hypothesis as to what the internal structure might be like. Below is the key to the colors that illustrate the waves in each simulation.



Step 3. Draw your internal structure. If you need help check out the helpful hints to find out how different waves behave in different materials.

Step 4. Test your hypothesis by checking the answers.

Step 5. Answer the questions below.

Sphere A	Sphere B	Sphere C
		
Introduce S-waves only	Introduce S-waves only	Introduce S-waves only
Introduce P-waves only	Introduce P-waves only	Introduce P-waves only
Introduce both S- and P-waves	Introduce both S- and P-waves	Introduce both S- and P-waves
Check your hypothesis of the sphere's internal structure.	Check your hypothesis of the sphere's internal structure.	Check your hypothesis of the sphere's internal structure.

Questions:

How does this activity relate to the way geologists study our earth today?

What was the most difficult part of this activity?

How does this activity relate to other aspects of our lives such as x rays etc.?

See how many ways you can list that people use indirect sight to improve our lives today.

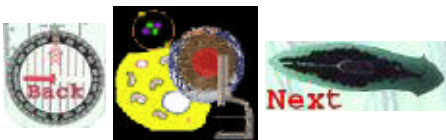
Hints:

Here are some hints that might help you in your quest:

L waves travel only on the surface of the earth, but are very damaging.

S waves travel only through solids, but slow down or speed up according to the density of the material.

P waves travel through solids, liquids, and, gases, but are affected by the density of the materials.



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